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PENSOFT

First record of *Carcinonemertes conanobrieni* Simpson, Ambrosio & Baeza, 2017 (Nemertea, Carcinonemertidae), an egg predator of the Caribbean spiny lobster *Panulirus argus* (Latreille, 1804), on the Caribbean Coast of Colombia

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Abstract

Carcinonemertes conanobrieni Simpson, Ambrosio & Baeza, 2017, an egg predator of the spiny lobster *Panulirus argus* (Latreille, 1804), is recorded for the first time in Colombian waters and the Caribbean. Worms were isolated from an egg mass of a lobster caught at the Gulf of Salamanca, Magdalena. Little is known about the distribution of this species and currently this record from the Caribbean Coast of Colombia is the only one outside of the Florida Keys, USA. The new record suggests that this parasite might be present in the entire Caribbean Sea.

Key words

Caribbean Sea; Magdalena Department; artisanal fishery; ribbon worms; parasite.

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Introduction

The Caribbean spiny lobster *Panulirus argus* (Latreille, 1804) is one of the most important economic resources for a large number of coastal fishermen communities. This species has a high market value and supports a multimillion-dollar fishery in the Greater Caribbean and the Gulf of Mexico (Seijo 2007). The fishing landings of this species in Colombia were estimated in 20.3 tons in 2016, and the commercial value per kilogram was about $5–8 (USD) (De la Hoz and Manjarrés-Martínez 2016). The overexploitation of the stocks and the destruction of the habitat have diminished the populations of *P. argus* and it is currently considered as a vulnerable species in Colombia (Ardila et al. 2002).

Nemerteans (Phylum Nemertea), also called ribbon worms, comprise a small group of about 1370 species, most of which are found in marine environments (Norenburg 2010). The main characteristic of this group is the presence of an eversible proboscis housed in a fluid-filled cavity (rhynchocoel) (Hyman 1951). Among nemerteans, the genus *Carcinonemertes* contains 16 species (Norenburg and Gibson 2012) of symbiotic egg predators of decapod crustaceans, mainly crabs and lobsters. Parasite worms can be found in different parts of the body, such

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as abdomen, gills, pleopods, and branchial chamber of either male or females hosts, but only reach full size and sexual maturity within the egg mass of an ovigerous female (Kuris 1993). An infestation by *Carcinonemertes* may cause a substantial decrease of the reproductive performance of the host (Kuris 1993, Torchin et al. 1996, Baeza et al. 2016).

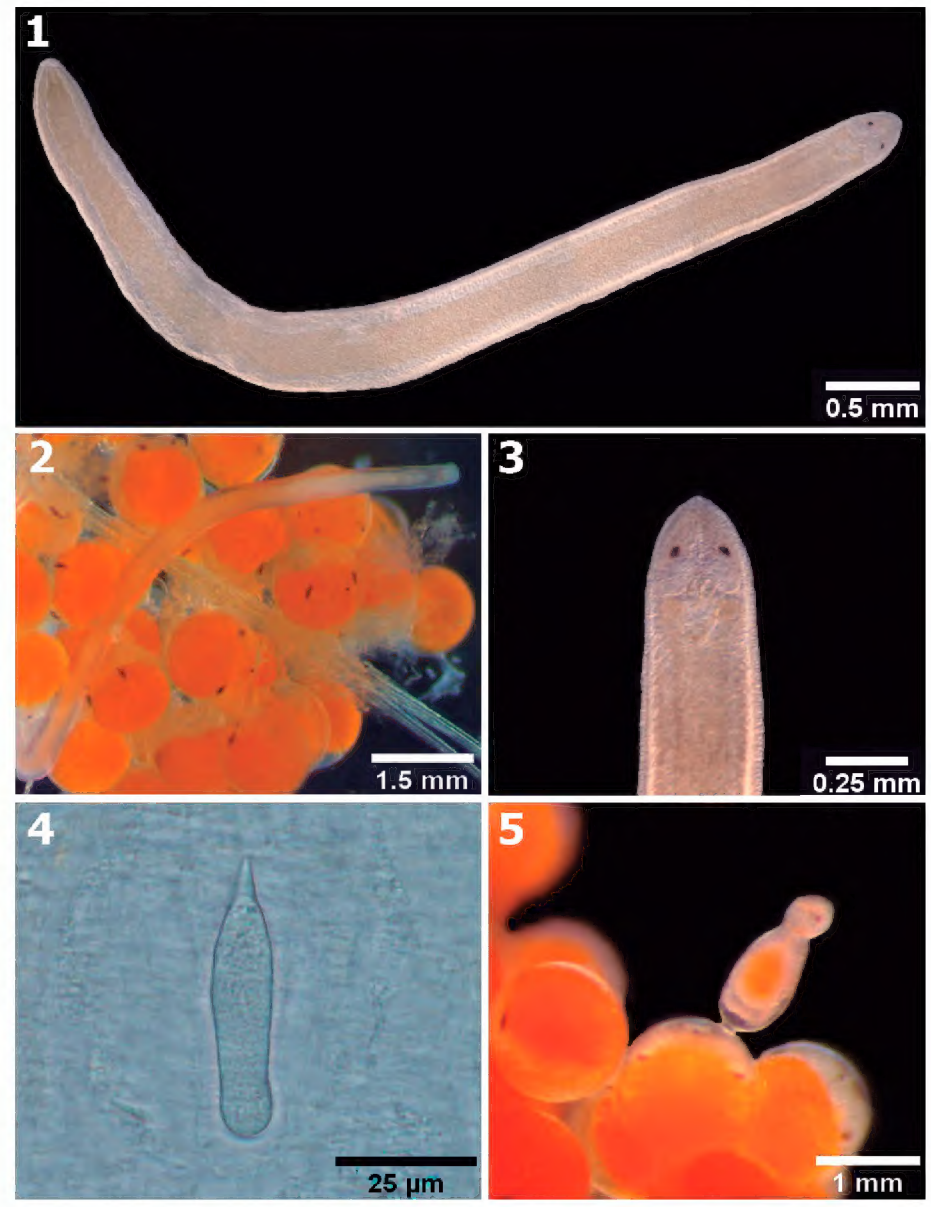
The parasite nemertean *Carcinonemertes conanobrieni* Simpson, Ambrosio & Baeza, 2017 was recently described from one population of the Caribbean spiny lobster *P. argus* in the Florida Keys and no other records have been reported to date. The parasite was infesting 7.4% of ovigerous female lobsters with densities ranging from 0.08 to 0.5 worms per 100 embryos affecting negatively the reproductive performance of the lobster (Baeza et al. 2016). Herein, *C. conanobrieni* is reported from the Caribbean Coast of Colombia and is the first record for the Caribbean Sea.

Methods

One gravid female lobster (LC: 12.2 cm) was obtained from an artisanal fishery in the Gulf of Salamanca, Magdalena, North Coast of Colombia (10.9633° N, 074.9636° W). This sample, included in the framework of the research project "Gusanos cinta (Nemertea) y gusanos planos (Platyhelmintes) bentónicos marinos de la región de Santa Marta, costa Caribe de Colombia (Fase 2)", has been legally collected under the permit "Permiso Marco de Recolección de especímenes de especies silvestres de la Diversidad Biológica con fines de investigación científica no comercial" resolution 1293 (2013), expedited by the "Autoridad Nacional de Licencias Ambientales (ANLA)" granted to the "Universidad del Magdalena". Pleopods were dissected, and embryos were separated from the pleopods and placed in Petri dishes with microfiltered seawater. The embryo masses were then inspected for the presence of nemerteans (adults, juveniles, strings of eggs, and cysts) under a dissecting microscope (Zeiss Discovery V8 with an integrated Camera Zeiss Axiocam ERc5s). Four nemerteans were isolated from the embryo masses, relaxed in 7% $MgCl_2$ solution isotonic to seawater and photographed in vivo. Detailed images of the stylet were obtained by pressing the specimens between a slide and a coverslip and photographing it with a microscope (Zeiss Axiolab A1 with an integrated camera Zeiss ERc5s). Two specimens were fixed in 10% buffered formalin and finally transferred to 70% ethanol after at least 24 hours, the remaining were stored in 100% ETOH. All specimens were deposited in the "Centro de Colecciones Biológicas de la Universidad del Magdalena, CBUMAG" under batch label CBUMAG:NEM00070.

Results

New record. Colombia, Caribbean coast region, Magdalena department, Puebloviejo municipality (10.9633° N, 074.9636° W), Jaime Alberto Gonzalez Cueto and Sigmer Quiroga, 2017-09-04 (CBUMAG:NEM00070, 4 individuals).



Figures 1–5. *Carcinonemertes conanobrieni* from the Caribbean Sea. **1.** Dorsal view of the entire worm. **2.** One specimen found crawling on the egg mass. **3.** Detail of the anterior portion of the body, showing ocelli. **4.** Microscopic detail of stylet. **5.** A juvenile worm encysted next to a lobster embryo.

Identification. The examined specimens (Figs 1–5) were found crawling on the egg mass of a host lobster *Panulirus argus*. The worms were filiform in shape (length ca 5 mm and width ca 0.4 mm in relaxed specimens) with the anterior and posterior ends slightly pointed (Figs 1, 2). Cream in color without designs, but a darker yellowish region (somewhat orange) is distinguishable along the midline of body due to the gut content (Figs 1, 2). Head not demarcated from the body and without lateral extensions. Two red "rusty" elliptical simple eyespots are present, more or less of equal size, located near the brain and not visible from the ventral side (Fig. 3). Short central smooth stylet (length ca 9 µm), supported on a massive and posterior constricted basis (ca 43 × 11µm) (Fig. 4). Without accessory stylets. No gonads were observed in the specimens examined. Cysts (Fig. 5) were attached to the eggs, identical to the ones described by Simpson et al. (2017).

Here, we based our identifications on morphological characters, all of which fit the original description of *Carcinonemertes conanobrieni* (Simpson et al. 2017). In addition, traits such as specific host (spiny lobster) where the worms were found, and the shape of the egg capsules lay in the lobster's eggs (Fig. 5) represent additional support for species identification. According to the new

Table 1. Character checklist of *Carcinonemertes conanobrieni* Simpson, Ambrosio & Baeza, 2017. List of external characters that could be checked in order to provide a species description with comparable characters. Modified from Sundberg et al. (2016). Characters that were not appropriate were omitted.

	Character	Character state	Code
1	Biology	Parasitic	1
2	Habitat	Marine	0
5	Habitat	Epizoic	4
6	Substratum	Other (*Panulirus argus*)	5
7	Behavior when mechanically disturbed	Contracts without coiling into a spiral	0
	External morphology		
8	Cephalic furrows/slits	Absent	0
12	Head clearly demarcated from body	No	0
14	Shape of head/cephalic lobe	Pointed	2
15	Head viewed laterally	Without extensions	0
16	Cross section shape of body	Dorsal-ventrally flattened	1
17	Shape of posterior tip	Pointed	0
18	Eyes	Two eyes near brain	1
19	Eye distinctiveness	Eyes not visible from ventral side	1
20	Eye morphology	Simple	0
21	Relative eye size	All eyes more or less of equal size	0
22	Eye position relative to brain lobes	Confined principally or entirely to precerebral cephalic region but may extend back to above brain	0
23	General body color	Pale / Light	2
24	Primary dorsal body color	Other	8
25	Color pattern	Absent	0
26	Color of blood	Not applicable	3
27	Proboscis armature	With central stylet only	3
28	Number of accessory stylet pouches (H)	Absent	2
29	Number of stylets in each accessory stylet pouch (H)	Absent	3
30	Stylet : basis/stylet ratio	4:1	3
31	Stylet shaft	Smooth and straight	0
32	Shape of stylet base	Cylindrical	4
33	Median waist of stylet basis	Present	1
34	Proboscis used for locomotion	Unknown	0
35	Proboscis pore	Subterminal	1
38	Lateral margins	No distinction in color	1

proposal for describing species of nemerteans, suggested by Sundberg et al. (2016), a character matrix is given in Table 1 as an additional contribution to the original description.

Discussion

Carcinonemertes conanobrieni has been recently described (Simpson et al. 2017) and no other records have been reported. This record expands the knowledge of the distribution of this species from Florida to the southern Caribbean Sea (Fig. 6), suggesting that this nemertean might be present in the entire range of distribution of the host species *P. argus* (Fig. 6).

Studies on *Carcinonemertes* have shown that some species might have a wide distribution and are not host-specific; therefore, one species might affect different crustaceans (Torchin et al. 1996). The record of *Carcinonemertes conanobrieni* in the Caribbean Coast of Colombia, raises important questions about its distribution and abundance, presence of different populations throughout the Caribbean Sea, as well as its life cycle and potential hosts.

It has been observed that *Carcinonemertes* species cause high brood crustacean mortalities, e.g. *Carcinonemertes regicides* Shields, Wickham & Kuris, 1989 on the red king crab *Paralithodes camtschaticus* (Kuris 1993), *Carcinonemertes epialti* Coe, 1902 on the crab *Carcinus maenas* (Torchin et al. 1996), and *Carcinonemertes errans* Wickham, 1978 on the crab *Cancer magister* (Wickham 1979). Recent studies have revealed that an individual of *P. argus* that has been infected by *C. conanobrieni*, showed decrease in its fecundity and reproductive output (Baeza et al. 2016). Our finding warns about the importance of carrying out investigations to assess the impact of this parasite on the reproductive performance of *P. argus,* how it affects the population of this lobster, and the implications in the artisanal fishery.

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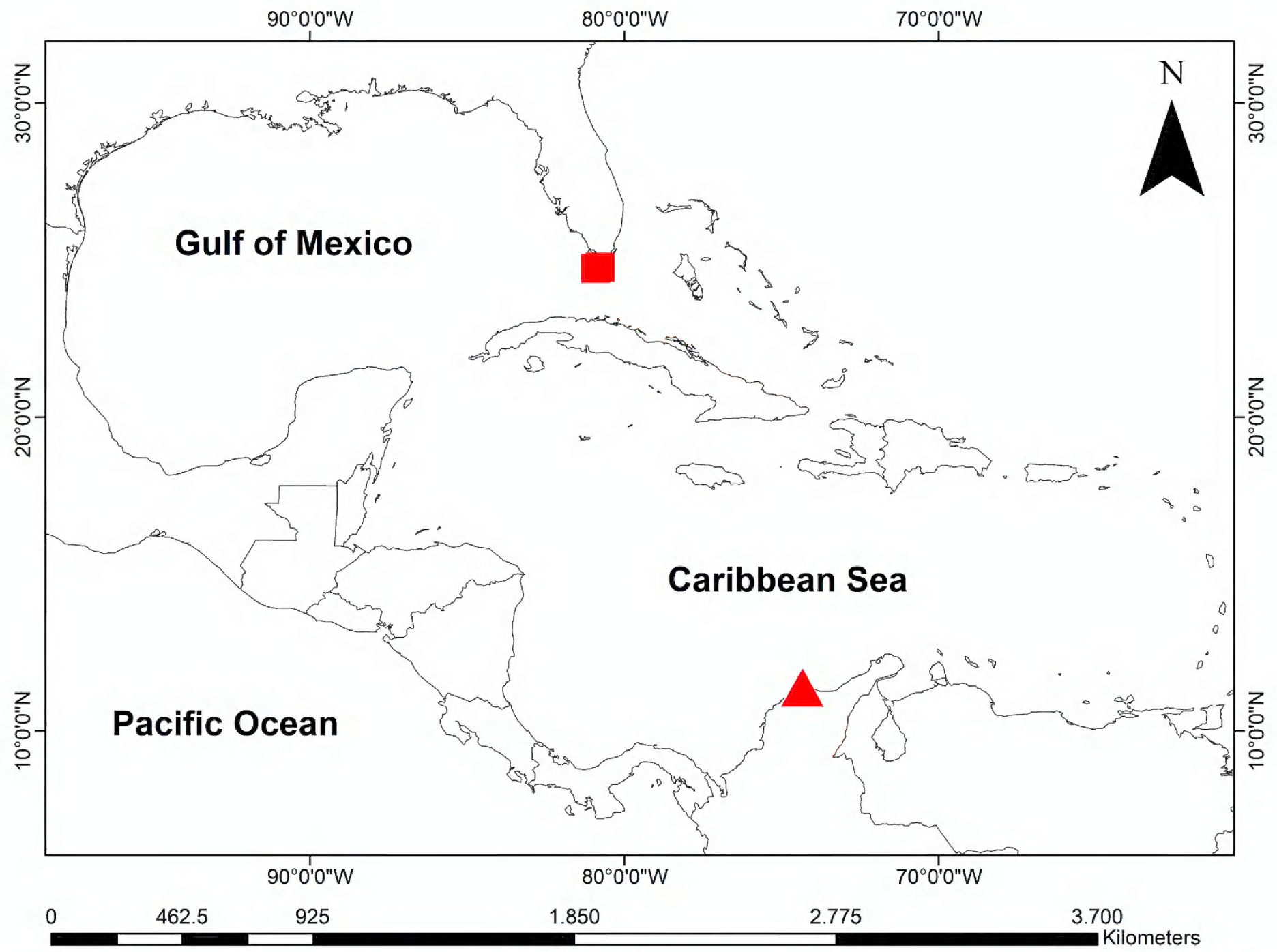

Figure 6. Records of *Carcinonemertes conanobrieni* in the Gulf of Mexico and Caribbean Sea. Red square points the type localy in the Florida Keys (24.7707° N, 080.7615° W; 24.7325° N, 080.9121° W). Red triangle points our new record from the Caribbean Coast of Colombia (10.9633° N, 074.9636° W).

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Authors' Contributions

JAGC and SQ collected the field data; SQ took the photographs; JAG measured the specimens; JAGC and SQ identified the specimens and wrote the manuscript.

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